APPENDIX C
DESCRIPTION OF INSPECTION TYPES

Excerpts from the Code of Federal Regulations
23 Highways - Part 650

Subpart C National Bridge Inspection Standards (NBIS)

1. Inventory Inspections

a. An inventory inspection is the first inspection of a bridge as it becomes part of the bridge inventory, but the elements of an inventory inspection may also apply when there has been a change in the configuration of the structure (e.g., widenings, lengthenings, supplemental bents, etc.). The inventory inspection is a fully documented investigation performed by engineers and technicians meeting the required qualifications for inspection personnel; it must be accompanied by an analytical determination of load capacity. The purpose of this inspection is twofold. First, it is used to determine all data for the "Structure Inventory and Appraisal Form" described in Appendices F and G to this Engineer Regulation plus other data required for U.S. Army Corps of Engineers records. Second, it is used for the determination of baseline conditions and the identification and listing of any existing problems or locations in the structure that may have potential problems. Aided by a prior detailed review of plans, it is during this inspection that any fracture-critical members (or details) are noted for subsequent focus and that assessments are made of other conditions that may later warrant special attention.

b. If the bridge subjected to an inventory inspection is anything other than a newly constructed structure, it may be necessary to include some or all of the elements of an in-depth inspection.

2. Routine Inspections

a. This is a regularly scheduled, intermediate level inspection consisting of sufficient observations and/or measurements to determine the physical and functional condition of the bridge, to identify any developing problems and/or change from "Inventory" or previously recorded conditions, and to ensure that the structure continues to satisfy present service requirements.

b. The routine inspection must fully satisfy the requirements of this Engineer Regulation with respect to the maximum inspection frequency, updating of structure inventory and appraisal data, and qualifications of inspection personnel. These inspections are generally conducted from deck, ground, and/or water levels, and permanent work platforms and walkways, if such are present. Special equipment (e.g. underbridge inspection equipment, rigging, or staging) is necessary for a routine inspection in circumstances where its use provides the only practical means of access to areas of the structure that are being monitored.

c. The results of a routine inspection are to be fully documented with appropriate photographs and a written report that includes any recommendations for maintenance or repair and for scheduling of follow-up in-depth inspections, if necessary. Load capacity evaluations will be provided to the extent that changed structural conditions would affect any previously recorded ratings.

3. Damage Inspections

These are unscheduled inspections to assess structural damage resulting from environmental or man-inflicted causes. The scope of inspection must be sufficient to determine the need for emergency load restrictions or closure of the bridge to traffic and to assess the level of effort necessary to effect a repair. The amount of effort expended on this type of inspection will vary significantly depending upon the extent of the damage. If major damage has occurred, inspectors must evaluate fractured members and section loss, make measurements for misalignment of members, and check for any loss of foundation support. A capability to make onsite calculations to establish emergency load restrictions may be necessary. This inspection may be supplemented by a timely in-depth inspection as described in paragraph (4) to document more fully the extent of damage and the urgency and magnitude of repairs. Proper documentation, verification of field measurements and calculations, and perhaps a more refined analysis to establish or adjust interim load restrictions are required for follow-up procedures. A particular awareness of the potential for litigation must be exercised in the documentation of damage inspections.

4. In-Depth Inspections

a. An in-depth inspection is a close-up, hands-on inspection of one or more members above or below the water level to detect any deficiencies not readily visible using routine inspection procedures. Traffic control and special equipment (e.g. underbridge inspection equipment, staging, and workboats) should be provided as necessary to obtain access. Personnel with special skills such as divers and riggers may be required.

b. When appropriate or necessary to fully ascertain the existence of or the extent of any deficiency(ies), nondestructive tests and/or other physical and chemical tests may need to be performed.

c. The inspection may include a load rating to assess the residual capacity of the member or members, depending upon the extent of the deterioration or damage.

d. This type of inspection can be scheduled as a supplement to a routine inspection, though generally at a longer interval, or it may be a follow-up for damage or inventory inspections. It may include a diving inspection, if needed.

e. On small bridges, the in-depth inspection, if warranted, should include all critical elements of the structure, but for large and complex structures, these inspections may be scheduled separately for defined segments of the bridge or for designated groups of elements, connections, or details that can be efficiently addressed by the same or similar inspection techniques. If the latter option is chosen, each defined bridge segment and/or each designated group of elements, connections, or details will be clearly identified as a matter of record, and each will be assigned a frequency for reinspection. To an even greater extent than is necessary for inventory and routine inspections, the activities, procedures, and findings of in-depth inspections must be completely and carefully documented.

5. Interim Inspections

a. Interim inspections are scheduled at the discretion of the individual responsible for bridge inspection activities. An interim inspection is used to monitor a particular known or suspected deficiency (e.g. foundation settlement or scour, member condition, the public's use of a load-posted bridge, etc.) and can be performed by any qualified person familiar with the bridge and available to accommodate the assigned frequency of investigation. Under the NBIS qualification requirements for inspection personnel, the individual performing an interim inspection must be carefully instructed regarding the nature of the known deficiency and its functional relationship to satisfactory bridge performance. In this circumstance, guidelines and procedures on what to observe and/or measure must be provided, and a timely process to interpret the field results must be in place.

b. The determination of an appropriate interim inspection frequency should consider the severity of the known deficiency.

6. Diving Inspection

a. A bridge shall require a diving inspection if it meets one or more of the following diving criteria:

(1) A bridge with any portion of a substructure exposed to water deeper than 1.8 m (6 ft) during periods of normal low water shall be designated for diving inspection.

(2) A bridge with any portion of a substructure exposed to water deeper than 0.9 m (3 ft), but no deeper than 1.8 m (6 ft), during periods of normal low water may or may not be designated as a bridge requiring inspection by divers depending on the judgment of the professional engineer in charge of diving inspection activity. In making this determination, the professional engineer shall take into consideration, among other factors, structure type, materials of construction, foundation type, footing location relative to channel bottom, known or suspected problems, waterway characteristics, superstructure and substructure redundancy, etc. In making this evaluation and resulting determination, existing bridge records, including existing inspection information, shall be reviewed.

(3) A bridge with no portion of any substructure unit exposed to 0.9 m (3 ft) or more of water during periods of normal low water will normally not be designated for diving inspection.

b. Diving inspections may be performed as part of a routine inspection, an in-depth inspection, a special inspection, or as an independent inspection effort. When making determinations on the need for a diving inspection, it must be recognized that bridges are constructed of differing structural configurations and

situated in widely varying environments. This results in varying degrees of inspection difficulty, complexity, structural redundancy, and structural sensitivity. Portions of the diving inspection criteria intentionally leave discretion to provide for proper bridge-by-bridge evaluation of the above and other factors in determining the need for a diving inspection. Diving inspections shall be performed at maximum inspection intervals of 60 months. However, it shall be determined, on a bridge-by-bridge basis, if a “complete” or “partial” diving inspection is needed on a more frequent basis. If it is determined that more frequent diving inspections are needed, they shall be scheduled.